Savannah Harbor
expansion project

"This Nation, and we in the Corps, have learned many lessons about the incredible importance of maintaining a balance between human needs, economic growth, and sustaining the environment. In the past, our science was not adequate to fully understand the impacts of our actions on the environment. That is now changing as science improves."

Lt. Gen. Robert B. Flowers
Commander
U.S. Army Corps of Engineers

SAVANNAH HARBOR EXPANSION STUDIES
PULLOUT POSTER
AT PAGE 6

US Army Corps
of Engineers
Savannah District

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september 2003

Front Cover:
Soon after Savannah Harbor was deepened in the early 1990's, it became obvious to the Georgia Ports Authority that the faster than projected growth would soon outstrip the capacity of the newly improved channel.

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Savannah Harbor Expansion Project (SHEP) Studies pullout poster at Page 6 ►

SHEP studies represented pictorally and graphically. Easy to understand and shows how studies relate to one another.

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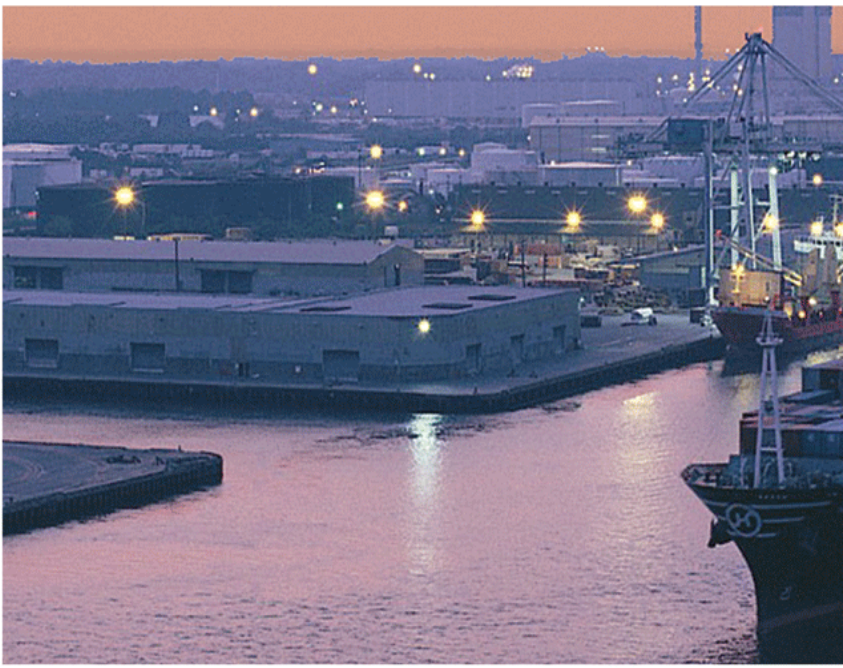
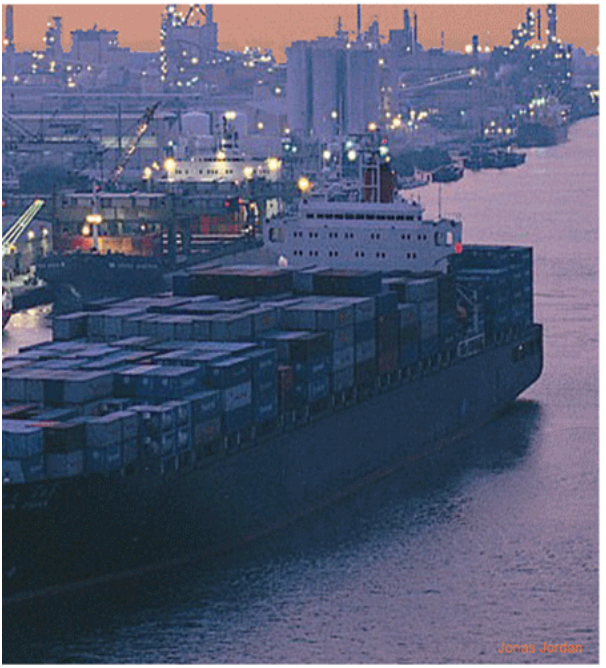


Savannah Harbor
expansion project

Impact to the Nation
Will proposed harbor deepening impact military readiness?



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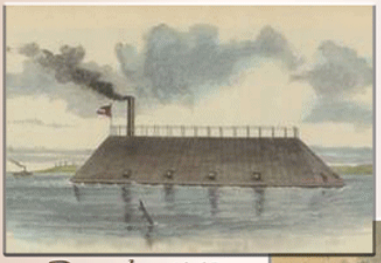
Georgia Anchorage, Vol. 42, No. 4, Portfolio, SHEP Update
Georgia Anchorage, Vol. 43, No. 1, Keeping Ahead of the Growth Curve
Georgia Anchorage, Vol. 43, No. 1, Port of Savannah's Ocean Terminal Plays a Key Role in Deployment of the 3rd Inf. Div. (Mech.)
Savannah Morning News, Oct. 6, 2002, Deep Subject
Savannah Morning News, Feb. 23, 2003, Super Ships
Savannah Morning News, July 5, 1998, Editorial by Doug J. Marchand, executive director, GPA
Savannah Morning News, June 11, 2002, Aquifer Studies
USGS website - wwwga.usgs.gov and wwwsofia.usgs.gov
GPA website - www.sysconn.com/harbor/
Savannah District's website - www.sas.usace.army.mil



December 1862

February 23, 1863

February 14, 1863

(Above, left, and top left) Drawings of the CSS *Georgia* from the perspective of different artists.

CSS Georgia: Studies underway to investigate impact of harbor expansion

Investigations of the wreck of the Confederate ironclad CSS *Georgia* have begun again following a 20-year hiatus. The wreck site is located adjacent to the Savannah Harbor navigation channel opposite Old Fort Jackson historic site, about three miles downstream from the city of Savannah.

In the late 1970s and early 1980s, the Savannah District conducted investigations to gather information to nominate the site to the National Register of Historic Places, to determine the effect of harbor maintenance activities, and to identify alternatives to avoid or minimize impacts," said Judy Wood, archaeologist, U.S. Army Corps of Engineers, Savannah District. As a result of these studies, dredging procedures were modified to avoid impacts to the site.

"For more than 20 years, the District used remote sensing equipment to monitor the site's condition," Wood said. "Survey data from the past several years indicate that the wreck is deteriorating and these studies will determine whether harbor maintenance activities are contributing to the deterioration, and if so, the alternatives available to mitigate these effects," she said.

The new studies, being designed and implemented in consultation with a number of agencies, will also investigate the possible effects associated with the proposed Savannah Harbor Expansion Project. "The channel deepening research is being conducted in partnership with the Georgia Ports Authority," said Col. Roger A. Gerber, commander, Savannah District.

Other agencies involved in the studies include the Georgia and South Carolina State Historic Preservation Offices and each state's Archaeologist Offices, the Underwater Archaeology Branch of the U.S. Navy's Naval Historical Center, the Submerged Resources Center of the National Park Service, and the Corps' St. Louis District. "These studies will allow us to determine the best course of action and the best methods to preserve the wreck," Gerber said.

Historians will re-examine and consolidate previous research, and scour archival repositories and collections to locate new information. At the request of the Savannah District, the Corps' St. Louis District, a nationally recognized center of expertise for curation of archaeological collections, initiated a study of conservation and curation alternatives for artifacts and vessel parts that would be recovered during implementation of various mitigation alternatives. "Since conservation and curation are the most difficult and costliest part of any shipwreck investigation, we need to make sure that conservation and curation needs are clearly understood when evaluating mitigation alternatives," Wood said.

Underwater archaeologists began an investigation of the wreck site in July 2003. The wreck is located in about 40 feet of water. The near-zero visibility, high-current environment creates a dangerous work place. Currents restrict diving to three- or four-hour periods around low or high tide.

Researchers are using high-tech equipment to overcome the environment. They first mapped the site using remote sensing equipment. Multibeam-hydrographic surveys created a three dimensional site map. Side scan sonar provided detailed images of exposed wreck parts. A cesium magnetometer located exposed and buried iron objects. All of the data were put into a Geographical Information System format to create a base map that divers use to guide their work and plot their finds.

Surface supplied air and a communication system enhance safety and keep the diver in contact with the surface. A sector scanning sonar sweeps the area continuously to show a live ultrasound-like site image, allowing those on the surface to direct the diver to work areas. Divers cannot read tape measures in the dark, so they locate and measure objects using a hand-held transponder that electronically sends locational data to the surface to be plotted on the site map.

"The Savannah District is taking a pioneering lead in developing the plan for documenting and managing this wreck," said Larry Murphy, chief, Submerged Resources Center, National Park Service. "In addition, from the initial project's design phase, public interpretation has been a central element," he said.

"This project will require innovative approaches involving state-of-the-art technology and high-quality professional underwater archaeological expertise as well as effective and flexible management oversight to obtain the maximum information available from the site and determine the most effective management alternative for the public benefit," Murphy said.

U.S. Army Corps of Engineers' ship simulator tests vessel handling on Federal Navigation Channel

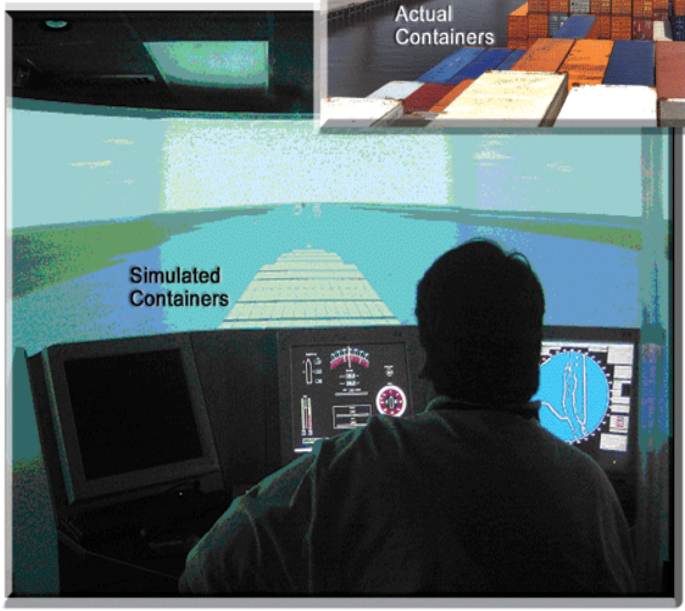
As part of the work to prepare the Tier II Environmental Impact Study for the proposed Savannah Harbor Expansion Project, the Savannah River Pilots are using a computer model which simulates the handling characteristics of ships transiting the Federal Navigation Channel in Savannah. The model, developed by the U.S. Army Corps of Engineers Waterways Experiment Station, digitally reproduces the bends, currents and features of the channel from the pilots' station to the Georgia Ports Authority Garden City Terminal.

Beginning in September 2002, a total of 10 pilots participated in using the model with two pilots traveling to Vicksburg, Miss., for each of five different five-day periods. The goal was for the model to simulate as close as possible the vessel handling conditions on the river. The pilots' knowledge of the specific conditions of the Savannah Navigation Channel was crucial to ensuring that the model performed correctly.

The vessel which was used for the simulation runs for the expansion project was the S Class Maersk Lines, a 7,226 TEU container ship that is 1,138 feet long, 140.4 feet wide, with a design draft of 47.6 feet. While the Maersk Lines S series vessel design was being used for the simulation of the deep draft scenario, other carriers have similar ship building trends and the Maersk was used as a ship typical of container ship trends.

The vessel used to represent current river traffic was the *Sea Land Performance*, a 4,614 TEU container ship that is 950 feet long, 106 feet wide, with a design draft of 33 feet. The models of the *Susan Maersk* and the *Sea Land Performance* were used in various combinations along the river to model the design channel. The final channel design will be based on safety and manueverability of this type vessel when tested by the computer model.

(Right) An actual container ship vessel manuevers its way down the Savannah River.



(Left) During ship simulation, pilots viewed a computer screen depicting the Savannah River as viewed from the bridge of an actual vessel and operated the simulated vessel in a room set-up like an actual bridge. The pilots assisted first in making sure that the computer emulated the handling characteristics of vessels currently transiting the river and then in testing the design vessel for various deepening scenarios.

Photo provided by U.S. Army Corps of Engineers

AN OVERVI

Savannah Harbor Expansion Project

MAKIN' HER PRESENCE KNOWN

The MSC *Hudson* works her way up the Savannah River toward the port of Savannah. The 852-foot cargo vessel is a Post Panamax ship. With a beam measurement of 131 feet, the *Hudson* is 25 feet too wide to fit through the Panama Canal.

Photo by Jonas Jordan

EW

Soon after the Savannah Harbor was deepened in the early 1990's, it became obvious to the Georgia Ports Authority (GPA) that the faster than projected growth would soon outstrip the capacity of the newly improved channel. GPA requested that the U.S. Army Corps of Engineers, Savannah District, conduct a preliminary reconnaissance study to determine whether it appeared warranted to further increase the capacity of the navigation channel.

In April 1996, the U.S. Army Corps of Engineers, Savannah District, was approaching the end of the reconnaissance study to deepen the Savannah navigation channel. This reconnaissance study was part of the decision process to determine whether there was sufficient justification to conduct a feasibility study to determine the National Economic Development (NED) benefits that would justify federal cost sharing.

As that study neared completion, it became more obvious to the Georgia Ports Authority that the findings would be positive and there would be justification to conduct a follow-on study, called a feasibility study. At the same time it was becoming more

(For more, see page 6)

An Overview

(Cont'd. from Page 5)

and more apparent that there was some urgency to conducting the feasibility study to have it included in the next Water Resources Development Act (WRDA) to be considered in Congress.

A decade before, Congress provided for the ability of non-federal project sponsors, such as GPA, to conduct feasibility studies in the 1986 WRDA. This provision preserved the ability of sponsoring organizations to share the study costs with the federal government if the project proved to be economically feasible. "The Section 203 authority, established by WRDA '86 was originally designed to lessen the time it takes a project to get from feasibility to construction," said David Schaller, deputy executive director, GPA. "The average deepening project in the nation takes between 12 and 15 years. One reason is because the USACE activity is dependent on the federal funding levels provided by the Administration and Congress each year.

"As the lead on the feasibility effort, we believed we could provide continuous funding to keep the project schedule on track, hopefully lessening the time to project completion," Schaller said.

This Section 203 study would determine the economic justification for the project and generate an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA).

Congress develops a WRDA

Congress develops a WRDA, normally every two years. This Act contains the legislation that authorizes USACE to proceed with the engineering, design, and construction of navigation projects, among others. The addition of this legislation is critical to the timeliness of a navigation project. Missing the WRDA development cycle can create a delay of at least two years, possibly more.

Although congressional events precluded passage of a WRDA in the 1998 Congressional session, the pending legislation was considered and passed in the 1999 session. Consequently, every goal for the first phase of the project was met. The project was determined to be feasible and the preferred plan was determined to be "up to 48 ft."

Tier II safeguards

The project authorization also contained specific conditions that had to be met before any plan was implemented on the project.

The first condition stipulated that the Secretary of the Army, in consultation with affected Federal, State of Georgia, State of South Carolina, regional, and local entities, reviews and approves a Tier II Environmental Impact Statement (EIS) for the project that includes an analysis of the impacts of project depth alternatives ranging from 42 feet through 48 feet; and a selected plan for navigation and an associated mitigation plan as required under federal law (33 U.S.C. 2283(a)).

The second condition stipulated that the Secretary of the Interior, the Secretary of Commerce, the Administrator of the Environmental Protection Agency, and the Secretary of the Army approve the selected plan and determine that the associated mitigation plan adequately addresses the potential environmental impacts of the project.

In addition to the above two items, the legislation required that a favorable report from the Chief of Engineers be issued on the project prior to December 31, 1999.

Group involvement

The Georgia Ports Authority immediately started studies to address concerns that surfaced during the review process of the Tier I EIS. They created and hosted a forum for organizations and citizens with an interest in the project, called the Stakeholders Evaluation Group. "Georgia Ports Authority has hosted in excess of 100 public meetings involving Stakeholders over a period of 52 months from January 1999 through June 2003 resulting in trust and cooperation among the participants," said Douglas Plachy, senior project manager, Savannah District.

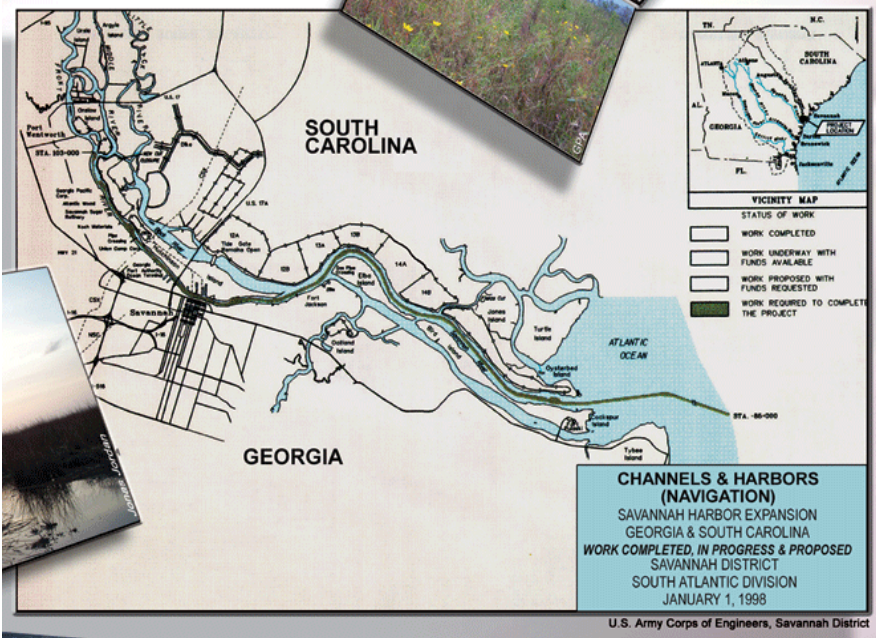
"The groups involved with SHEP have been

very interested in the type and degree of review conducted on the scientific and technical analysis work," said Larry Keegan, GPA project manager, Lockwood Greene Engineers. "Their interest is one of the factors behind the external review. Working with these groups throughout the study is key to a successful outcome. It has allowed much better understanding of the environmental concerns; technical work, and plan formulation decisions than is achievable otherwise," he said.

Moreover, Plachy said "the things we are doing on this project are progressive, inclusive, and open. We are using the latest technology available to identify and evaluate impacts associated with the implementation of alternative plans on the project. We are working in concert (sort of hand-in-hand) with three other Federal Agencies to cooperatively produce the General Reevaluation Report (GRR) and EIS. These agencies have and will be involved in each and every major decision on the project. We are also involving the public and State agencies in each step of the progress of the work.

"In addition to the NEPA requirements for public input, we are also using the Stakeholders Evaluation Group (SEG) that was formed by the GPA. For the State agencies we are utilizing Inter-agency Coordination Meetings – groups of experts in different technical areas."

(For more, see Page 8)



U.S. Army Corps of Engineers, Savannah District

An Overview

(Cont'd. from Page 7)

SHEP

General Reevaluation Study

The report of the Chief of Engineers was issued on the project on October 21, 1999, and although it was a favorable report, it did require the preparation of a General Reevaluation Report (GRR) in addition to the authorization requirements. The purpose of the General Reevaluation study is to determine all of the practical alternatives for the project. Each alternative would be analyzed in detail to determine the effects of each and the cost for construction of each alternative.

Similarly, the benefits for each alternative, as determined by USACE-prescribed methodology that emphasizes the National Economic Development Plan, would be determined for each alternative. Determination of feasibility would be based on a ratio of *benefit to cost* for each alternative. A benefit to cost ratio of at least 1:1 means that for every dollar spent on the project, at least one dollar in benefits will be realized. In addition, the preferred plan for Federal participation in construction cost sharing is determined by the alternative with the maximum net benefits among the alternatives. However, a major part of determining the costs is the determination of the impacts on the environment and the resulting mitigation costs.

Agencies come together

In July 2001, the Department of the Army and the Georgia Ports Authority entered into a Memorandum of Understanding on the Savannah Harbor Expansion Project. The MOU established a framework for the development of the Tier II EIS. "A key aspect was the concept of asking the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the Environmental Protection Agency to work with GPA as Cooperating Agencies with the U.S. Army Corps of Engineers taking the lead on the EIS," Plachy said.

This has integrated those agencies into the study process, the plan formulation, and the environmental impact conclusions and mitigation or consistency decisions. This integration is a significant contributor to the expertise, range and depth of the study with the result being a high degree of confidence in the conclusions and thoroughness of the study.

Independent Technical Review

Due to the complexity of the project, the economic analysis, the aquifer analysis and the Hydrodynamic & Salinity model are receiving external independent review in addition to Independent Technical Review (ITR), Keegan said. The H&S model also underwent a Federal and state agency review. The Dissolved Oxygen model will receive ITR and agency (state and Federal) review.

"The ITR process is different in that individual items of technical study are receiving ITR as well as the final General Reevaluation Report and Environmental Impact Statement," Keegan said. Additionally, extra care is being taken to have the ITR work done by a peer external to the Savannah District to ensure an objective review.

"The standard that I put down which is even stricter than the standard that's coming out of the National Academy of Sciences (NAS) report is that we are going to have an external review, not only to the Corps, but external to the Federal government," said Plachy. "In other words, there would be no Federal government entity as part of this external review, again to give it one more level of separation from the Administration, in regards to the comments and reviews on the project."

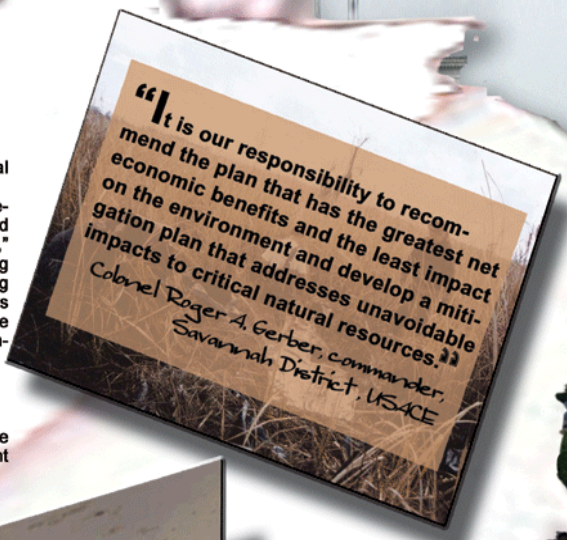
Keegan said the proposed Savannah Harbor Expansion project is nearing

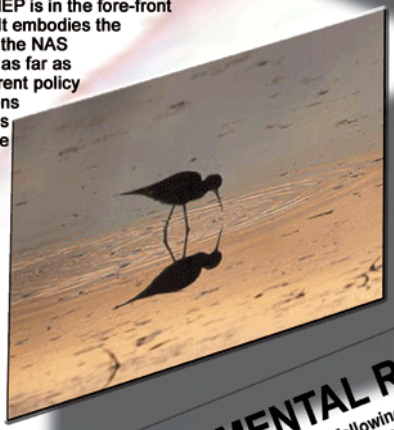
completion of the scientific and technical analyses.

"The various models are nearing completion of their refinement or development and calibration and will be ready for use soon," Keegan said. "Methodology for assessing impacts on fishery resources is nearing completion; cultural resource investigations are well underway; economic analyses are underway; and plan formulation and screening is underway."

Bottom Line

According to Plachy, the bottom line is the review package for SHEP is in the fore-front of change in USACE. It embodies the spirit and the intent of the NAS study report and goes as far as possible given the current policy and legislative directions which USACE operates to incorporate objective review. To date, there have been no conclusions inconsistent with those from the feasibility study.



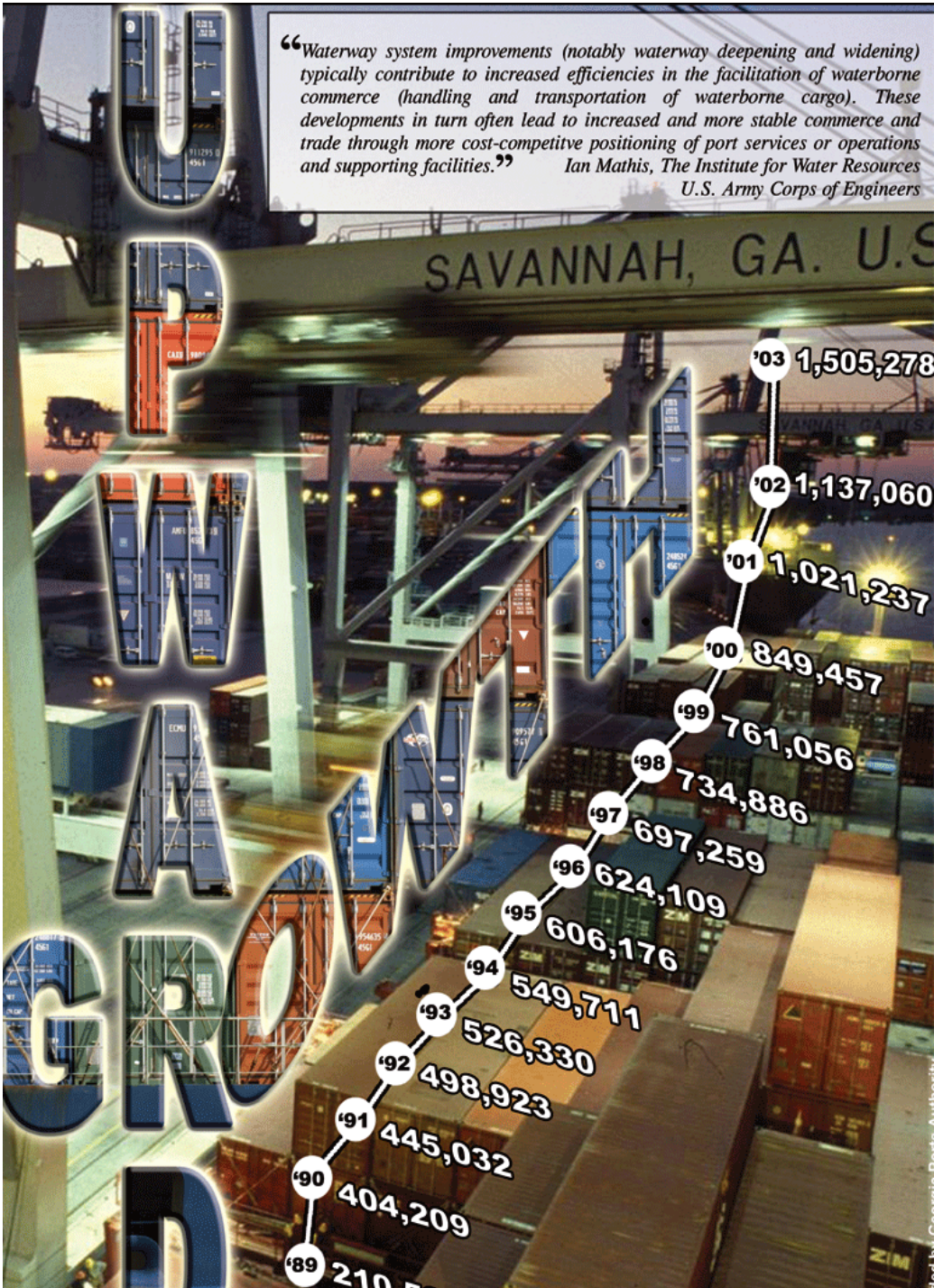


ENVIRONMENTAL REVIEWS

Environmental reviews are required from the following agencies or offices:

- U.S. Fish and Wildlife Service (endangered species)
- U.S. Fish and Wildlife Service – Savannah National Wildlife Refuge (use of refuge property)
- National Marine Fisheries Service (endangered species)
- Georgia Department of Natural Resources – Environmental Protection Division (water quality certification)
- Georgia Department of Natural Resources – Coastal Resources Division (coastal zone management consistency certification)
- Georgia State Historic Preservation Office (cultural and historic resources)
- South Carolina Department of Health and Environmental Control (water quality certification)
- South Carolina Department of Health and Environmental Control – Office of Ocean and Coastal Resource Management (coastal zone management consistency certification)
- South Carolina State Historic Preservation Office (cultural and historic resources)

In addition, the Fish and Wildlife Coordination Act requires full coordination of potential project impacts with Federal and State agencies responsible for management of fish and wildlife resources. Savannah District meets with technical experts in these Federal and State natural resource agencies as part of the coordination process on a regular basis. Coordination is also required with the National Marine Fisheries Service for potential impacts to essential fish habitat.


"Waterway system improvements (notably waterway deepening and widening) typically contribute to increased efficiencies in the facilitation of waterborne commerce (handling and transportation of waterborne cargo). These developments in turn often lead to increased and more stable commerce and trade through more cost-competitve positioning of port services or operations and supporting facilities." Ian Mathis, The Institute for Water Resources U.S. Army Corps of Engineers
SAVANNAH, GA. U.S
UP AND GROWING
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'02 1,137,060
'01 1,021,237
'00 849,457
'99 761,056
'98 734,886
'97 697,259
'96 624,109
'95 606,176
'94 549,711
'93 526,330
'92 498,923
'91 445,032
'90 404,209
'89 210,582

Port of Savannah: *Positions at 5th largest in nation, among fastest growing in world*

The Port of Savannah continued its upward growth yet again in fiscal year 2002 for volume of containerized cargo. In FY02 the port exceeded the million twenty-foot-equivalent units (TEUs) mark just 11 months into the operating year. The port concluded the year with a record volume of containerized cargo of more than 1.3 million TEUs. The Port of Savannah was the fastest growing container port in the nation during calendar year 2001.

Over the past seven years, container tonnage handled through the Port of Savannah has grown more than 80 percent.

For perspective, if the more than 1.1 million TEUs that moved in and out of Savannah during fiscal year 2002 were laid end to end, they would stretch some 4,300 miles, or approximately from Savannah to Phoenix and back again.

Much of the growth in containerized cargo is connected to the high-volume import distribution centers and manufacturing facilities that have located within close proximity to Savannah. During fiscal year 2002 (July 2001-June 2002), Hugo Boss, Fred's Inc., and Pier 1 Imports announced new distribution facilities near the Garden City Terminal.

As a result of the consistent growth, consensus is that the proposed Savannah Harbor Expansion project has the potential to impact the Savannah port and the economy of the City of Savannah.

"Because of our ability to expand, invest in new equipment, hire additional trained personnel, and build the most efficient system of handling containers in the nation, Savannah is now recognized worldwide as a major regional cargo hub," said Doug Marchand, executive director, GPA.

As the volume of containerized cargo increases, the size of the ships that carry the containers will increase as well, and the container vessels calling on the Port of Savannah are getting larger and larger.

"Currently, these larger vessels are not able to load to their maximum capacity and travel at any tide," said David Schaller, deputy executive director, GPA . "In fact, more than 50 percent of the vessels currently calling on the Port of Savannah are considered operationally constrained, meaning the vessels cannot carry full loads at all tides," he said.

Due to constrained operations, GPA is spearheading the proposal to deepen the Savannah Harbor from its current 42 ft. to as deep as 48 ft.

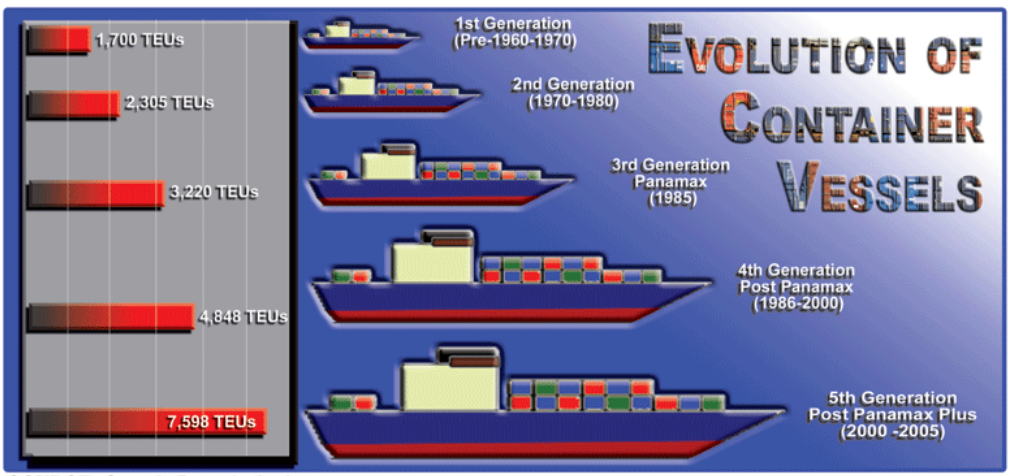
"This (proposed) deepening project will allow the Port of Savannah to more efficiently handle the vessels that are currently calling on the port, as well as prepare for the larger vessels that are expected to regularly call on Savannah in the future," Schaller said.

Consequently, according to the American Association of Port Authorities (AAPA), changing from a 2,500 TEU ocean carrier to one that can hold 6,000 TEUs can save a shipping company up to $4.5 million per voyage.

"It's more cost effective to ship in a container," said Charlie Sutlive, executive director, Savannah Maritime Association. Also, with a container, the chance of pilferage and damage due to handling is reduced, so more and more shippers are recognizing that containers are definitely the way to go, he said.

Since the late 1980s, some container ships (Post Panamax) have grown so large that they can no longer travel through the Panama Canal because they are too wide; however, these ships can still travel through the Suez Canal. The Port of Savannah has had some of these mega ships call on her port.

The size of a vessel and its cargo determine its draft - or space under the vessel. To enter a port safely, a ship needs an additional 4-5 feet of space between the hull (bottom of a ship) and the river bottom. As container ships continue growing in size, ports will have to consider other options such as harbor deepening or relocation of terminals to accomodate the draft.



SOURCE: Georgia Ports Authority

GRAPHIC: Mindy J. Anderson

FLORIDAN AQUIFER

District Spearheads Study

The U.S. Army Corps of Engineers, Savannah District, has been studying potential impacts of the navigation channel on the Floridan Aquifer for more than 20 years. In addition, at the request of GPA, the district took the lead on the 1997-98 study due to a growing necessity to protect this natural resource.

The district developed and performed a study focusing on the area along the present navigation channel of which a portion features the Tybee High which causes strata to be elevated and thinned. The principle objective of the investigation was to determine if additional deepening of the Savannah Harbor channel would have the potential to impact the upper Floridan aquifer, which occurs throughout much of the Southeast U.S. and lies under the Federal navigation channel.

Although challenged by some, the findings of the 1998 study were technically valid and scientifically based. The study concluded that the proposed dredging wouldn't have a noticeable effect on the quality and quantity of ground water within the upper Floridan aquifer.

What's Next?

Although the results and conclusions from the 1998 study were reasonable, developing additional data will better support decisions about potential impacts to the aquifer. Improved mapping of the confining unit thickness and a more indepth discussion of the vertical permeability and hydraulic gradients will be beneficial. Additionally, the studies will focus on the impact to the chloride levels in the Upper Floridan, and not on whether saltwater is moving downward from the surface along the river.

The Savannah District determined that supplemental data will be beneficial to augment and build on the previous Savannah Harbor Expansion Project study that was conducted in 1997-98 by the Savannah District. To this end, supplemental studies, including additional seismic surveying, additional land and marine drilling that will incorporate sediment pore-water analysis and multi-level well technology, and trial aquitard testing will be performed.

Purpose of Studies

To determine what, if any, impact removal of additional Miocene sediments within the dredging prism will have upon the water quality of the upper Floridan aquifer in the Savannah area.

To determine the change in rate and quantity of saltwater leakage through the upper Floridan (Miocene) confining unit that may result from harbor deepening.

To determine if there are changes in chloride concentrations (salinity) with time in the upper Floridan aquifer that may be caused by harbor deepening alternatives.

To determine the hydraulic properties, salinity and hydraulic head (and the spatial variability of these parameters) of the upper Floridan confining unit in the project area.

To determine the hydraulic properties and geometry of various paleochannels in sediments below the river channel.

To better define the geological framework in the channel area.

Grounds To Conduct Studies

Data pertaining to the hydraulic characteristics of the Miocene age upper confining unit is available, but there are relatively few site-specific data available at this time.

Sub-bottom geophysical survey data is key to the work necessary for a complete and comprehensive Environmental Impact Statement (EIS).

Even though the core borings were sufficient enough to obtain an idea of what the range of vertical permeabilty would be, it is recommended that more borings be taken and that they focus on improving the understanding of the infill material in the relict channels.

The number of additional test wells will be based on the need for assessing the gradient between the surficial aquifer and the upper Floridan aquifer within the vicinity of the Savannah River and specifically the navigation channel.

UNDERSTANDING FLORIDAN AQUIFER STUDIES

WHAT DOES IT ALL MEAN?

(District Spearheads Study)

Floridan Aquifer: One of the major sources of ground water supplies in the United States. An aquifer is a layer of water-bearing permeable rock, sand, or gravel capable of providing significant amounts of water.

Tybee High: A raised, regional subsurface geolocical structure or ridge.

Strata: Layers of geologic material laid down by natural forces and typically seen as bands of different colored or differently structured material exposed on river banks.

Ground water: Ground water lies almost everywhere below the earth's surface. Fifty-one percent of the U.S. depends on ground water daily for drinking.

(What's Next?)

Confining unit: A hydrogeologic unit made up of material that inhibits water from passing through.

Vertical permeability: The capacity of a porous material to transmit water. Sand and gravel have high permeabilities while clay has low permeability. Rate of movement is measured by hydraulic conductivity.

Hydraulic gradients: The slope of the ground water level.

Seismic surveying: An indirect method of mapping subsurface sediment layers and features using sound waves.

Sediment pore-water analysis: The analysis of ground water samples taken from cores of water bearing soil or rock. The water is derived from the space between grains of soil or rock.

Aquitard: A water-saturated sediment or rock whose permeability is so low it cannot transmit any useful amount of water.

(Purpose of Studies)

Miocene sediments: Sediments deposited during the Miocene epoch of geologic time (about 5 to 25 million years ago).

Saltwater leakage: The downward flow of seawater through underlying sediments.

Chloride concentrations (salinity): The concentration of naturally occurring sodium chloride content in seawater.

Hydraulic properties: The various properties (such as hydraulic conductivity and permeability) that define the ability of water to flow through a soil or rock.

Hydraulic head: The energy that causes ground water to flow; the total mechanical energy per unit weight; the sum of the elevation head and the pressure head.

Spatial variability: The variation in values for a particular property when the property is measured at different points.

Paleochannels: The buried sediment-filled remnants of ancient stream and river channels.

(Grounds To Conduct Studies)

Miocene age upper confining unit: The relatively low permeability geologic unit above the Floridan aquifer that impedes the vertical flow of water into or out of the aquifer.

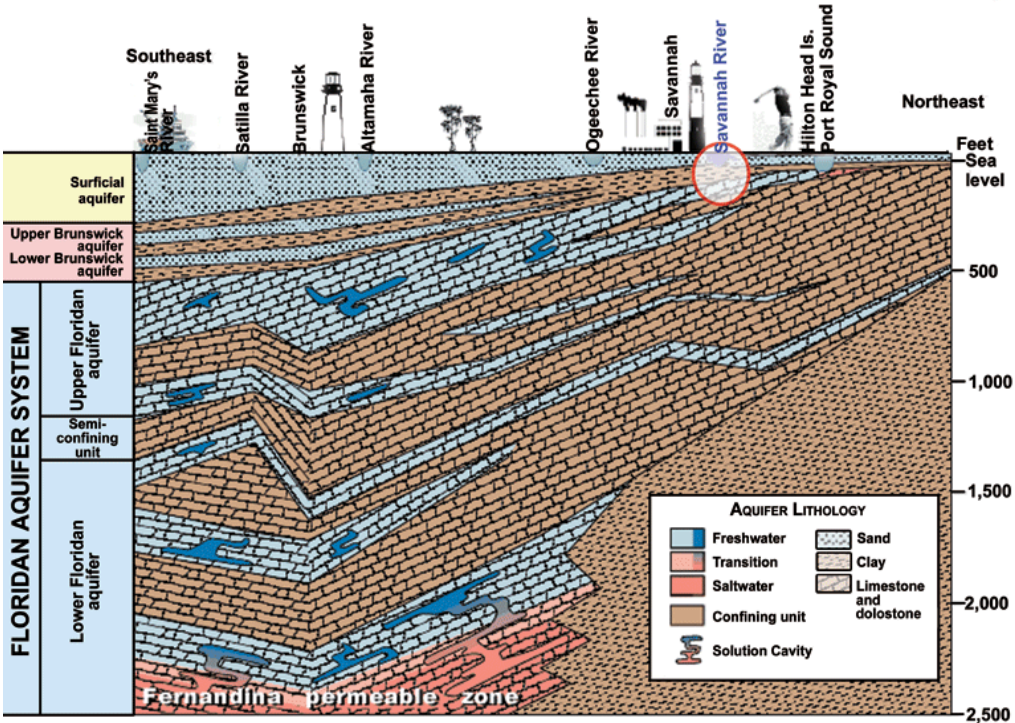
Sub-bottom geophysical survey data: (See seismic surveying)

Environmental Impact Statement (EIS): A document prepared to describe the effects of proposed activities on the environment.

Core borings: Borings drilled to obtain samples (cores) of soil and rock.

Infill material: Soil or sediment that, through time, has filled a paleochannel.

Relict channels: (Same as paleochannels)

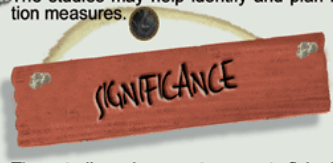


ertical scale greatly exaggerated

Modified from Krause and Randolph, USGS, 1989

- To document distribution and habitat utilization of adult and juvenile shortnose sturgeon in the Savannah River estuary.
- To identify the location of spawning aggregations of recreationally important sciaenid (red drum, spotted seatrout) in Savannah Harbor and determine when spawning occurs.
- To document the spatial, seasonal and interannual use of nursery habitats by estuarine dependent species within the Savannah River estuary.
- To evaluate striped bass spawning and reproductive status in the Savannah River estuary.

- The studies will help determine the magnitude and significance of project impacts.
- The studies can assist in planning the project to avoid or minimize impacts to fish habitat.
- The studies may help identify and plan mitigation measures.



- The studies document current fish habitat utilization in the Savannah River estuary and identify important habitat areas.
- By comparing current habitat utilization to environmental conditions the studies can be used for impact assessment.
- The studies may serve as a baseline for post-project monitoring to document future project impacts.

- Several important habitat areas that were heavily utilized by shortnose sturgeon were identified and environmental conditions were documented.
- Eight large spawning aggregations of sciaenid were located. Seasonal use and environmental conditions were documented.
- The Savannah River estuary supports a diverse and productive fish community. Distribution of some species is related to salinity while others utilize a wider salinity range.
- Collection gear is effective to detect striped bass spawning. Egg density in the estuary increased from 1999 to 2000 but little spawning occurred in Back River. Egg development in Savannah River striped bass appears to be normal.

GPA-sponsored fish, aquatic studies complete

A two-year study examining the types of fish that live in the Savannah River was completed October 2002. On Sept. 27, 2002, researchers with the South Carolina Department of Natural Resources wrapped-up the sampling of the Savannah River fish species as part of a study associated with the proposed Savannah Harbor Expansion Project. The Georgia Ports Authority is the sponsor of this study, and the results will be used in the Environmental Impact Statement (EIS) that is required for the proposed harbor deepening project.

Environmental Impact Statements are required when significant habitat-altering activities are planned, such as the proposed harbor deepening.

"In this case, our work identified potential at-risk species (or groups of species) that may be useful in monitoring potential affects of various deepening scenarios," said Cecil Jennings, Biological Research Center, U.S. Geological Survey. "Our results also may be useful in deciding how best to mitigate potential project effects."

This work represents one of the most comprehensive research efforts of Savannah River fish species ever undertaken in the estuary.

"The collaborative scientific work involved researchers from the University of Georgia Cooperative Fish and Wildlife Research Unit and the Marine Resources Research Institute of the South Carolina Department of Natural Resources," said Hope Moorer, program manager, Navigation Improvement Projects, GPA. "The Georgia Ports Authority has funded the study costs of approximately $965,000. Knowledge of fish species and their habitats will be used in association with a computer model that will predict any changes in habitat that may occur as a result of the deepening project," Moorer said.

Biologists sampled the same eight areas in the Savannah River every two weeks for the past two years to learn more about the types of fish that live in the estuary.

"The study identified the spatial and temporal distribution of estuarine-dependent fishes," "These data are needed to assess the potential affects of harbor deepening activities on estuarine species, but what those species were and when they were in the estuary were non-existent before our project began.

"Our project results also identified which species would experience population declines

(Above) South Carolina Department of Natural Resources wildlife biologists Amanda Avildsen and Chris Walling examine the number, species and size of various fish caught in the drag net they used to sample aquatic life in the Savannah River. (Bottom left) South Carolina Department of Natural Resources wildlife biologists Christin Way, left, and Chris Kalinowsky hoist the trawling net they pulled behind their boat as a means of gathering aquatic life samples in the Savannah River as part of an extensive study to determine possible effects to aquatic life of deepening the shipping channel.

or range contraction in the event of increased salinities (that may occur under all deepening scenarios)," Jennings said.

The Savannah estuary has essentially become an ecosystem highly influenced by human-induced activities.

"The Savannah estuary will need to be monitored over the long term to help identify positive environmental restoration and mitigation actions, and to insure new impacts are carefully evaluated," said Prescott Brownell, representative, National Marine Fisheries Service. "The goal should be to help foster needed economic development while implementing a careful conservation, monitoring, and restoration plan to insure long term health of the coastal marine/estuarine ecosystem and its public resources for the continuing benefit of the citizens of Georgia and South Carolina," Brownell said.

GPA has proposed the project to deepen the Savannah River up to an additional six feet to more efficiently accommodate the larger vessels calling on its facilities in Garden City.

"An enormous scientific effort is underway to produce the environmental impact statement, the purpose of which is to fully disclose impacts of the proposed harbor deepening," Moorer said. "The Stakeholders Evaluation Group has been actively involved in the identification of the scope of studies necessary for the Environmental Impact Statement and will recommend a consensus mitigation plan," she said.

The draft Environmental Impact Statement is scheduled for completion September 2005.

PORT OF SAVANNAH STANDS READY

(Above) The U.S. Naval Ship *Mendonca* sails from the Port of Savannah's Ocean Terminal. (right) A shrink-wrapped CH-47D Chinook aircraft is loaded onto the U.S.N.S. *Mendonca* mid-January 2003 in preparation for Operation Iraqi Freedom. (top right) Congressman Jack Kingston (1st Congressional District, Ga.) visits with crewmembers aboard the U.S.N.S. *Mendonca* docked at the Port of Savannah's Ocean Terminal.

Will Savannah harbor deepening impact military mission readiness?

The U.S.N.S. *Mendonca* and the U.S.N.S. *Gilliland*, two of the Navy's largest non-combatant ships, were the first to load out with military cargoes mid-January when Ft. Stewart and Hunter Army Airfield began moving military cargo out in support of Operation Iraqi Freedom.

The two vessels are large, medium speed, roll-on/roll-off (RoRo) ships usually docked in Newport News, Va. The third ship to load out was the U.S.N.S. *Brittin*. All three ships play a critical role in the Military Sealift Command and are considered fast sealift ships; loading and off-loading operations takes only 96 hours per shipload.

When fully activated, each ship is crewed by civilians and has a team of 14 military personnel serving as cargo supervisors to monitor and maintain vehicles and equipment while at sea. All three vessels are part of a 19-ship, $2.4 billion program begun in the mid-90s to improve the U.S. military's rapid response capabilities.

"With Hunter Army Airfield and Fort Stewart in close proximity, the Port of Savannah serves as a strategic location to assist in the deployment of military cargo, equipment and personnel during peacetime exercises and actual emergencies," said David Schaller, deputy executive director, Georgia Ports Authority. "Designated by the Department of Defense as one of the nation's strategic defense ports, the GPA terminals serve as the staging and loading point for several deployment readiness missions each year.

"Deployment readiness exercises are completed through the joint efforts of the members of the Savannah Port Readiness Committee, consisting of nine federal agencies and organizations whose collective mission is to coordinate peacetime preparations for emergency port operations and to plan for port operations in support of actual defense emergencies," Schaller said.

GPA's Ocean Terminal was utilized most recently for deployment of cargo for the war in Iraq. With its close proximity and strategic location, the Port of Savannah plays a critical role in deployment readiness for the 3rd Infantry Division from Ft. Stewart/Hunter Army Airfield.

"Savannah Harbor is very important to the rapid deployment of the 3rd Infantry Division (Mechanized) heavy division," said Col. Roger A. Gerber, commander, U.S. Army Corps of Engineers, Savannah District. "The proposed Savannah Harbor Expansion project would increase capacity in the port by allowing access to deeper draft ships and by increasing the maneuver space in the turning basin for the larger ships," he said.

THE FOLLOWING AGENCIES, OFFICES, AND CONTRACTORS ARE WORKING TOGETHER ON THE TIER II ENVIRONMENTAL IMPACT STATEMENT FOR THE SAVANNAH HARBOR EXPANSION PROJECT:

FEDERAL

Department of Army
ASA(CW) Office of Project Planning & Review
U.S. Army Corps of Engineers, Charleston District
U.S. Army Corps of Engineers, Headquarters
U.S. Army Corps of Engineers, Omaha District
U.S. Army Corps of Engineers, Pittsburgh District
U.S. Army Corps of Engineers, Savannah District
U.S. Army Corps of Engineers, South Atlantic Division
U.S. Army Corps of Engineers, St Louis District
U.S. Army Corps of Engineers, Wilmington District
U.S. Army Engineering Research & Development Center, Coastal & Hydraulics Laboratory
U.S. Army Engineering Research & Development Center, Environmental Laboratory
U.S. Army Hydraulic Engineering Center
U.S. Army Institute for Water Resources

Environmental Protection Agency, Region IV

Department of Interior
National Park Service, Submerged Resources Center
U.S. Fish & Wildlife Service, Charleston Area Office
U.S. Fish & Wildlife Service, Savannah Coastal Refuges
U.S. Fish & Wildlife Service, Brunswick Area Office
U.S. Geological Survey, Georgia District
U.S. Geological Survey, South Carolina District
U.S. Geological Survey, Georgia Fish and Wildlife Cooperative Research Unit
U.S. Geological Survey, Florida Fish and Wildlife Cooperative Research Unit

Department of Commerce
National Oceanography and Atmospheric Administration
NOAA Hurricane Center
NOAA National Marine Fisheries Service, Charleston
NOAA National Marine Fisheries Service, St. Petersburg

U.S. Coast Guard, Marine Safety Office

U.S. Department of Navy, Naval Historical Center

STATE & LOCAL

City of Savannah
Georgia Department of Natural Resources, Coastal Resources Division
Georgia Department of Natural Resources, Environmental Protection Division
Georgia Department of Natural Resources, Historic Preservation Division
Georgia Department of Transportation
Georgia Environmental Protection Division
Georgia Ports Authority
Skidaway Institute of Oceanography
South Carolina Department of Archives & History
South Carolina Department of Health and Environmental Control
South Carolina Department of Natural Resources
South Carolina DHEC - Bureau of Water Resources
South Carolina DHEC - Office of Ocean and Coastal Resource Management
South Carolina Institute of Archaeology and Anthropology
University of Georgia
University of South Carolina

PRIVATE

Advanced Data Mining, Inc
Applied Sciences & Associates
Applied Technology & Management
Camp Dresser & McKee, Inc.
David Miller & Associates, Inc.
Dial Cordy & Associates, Inc.
Global Insight, Inc
Griffen Management Consulting
Gulf South Research Corp.
InsideOut Profile Division, Inc.
Kilpatrick Stockton LLP
MACTECH Engineering & Consulting, Inc.
New South Associates
Panamerican Consultants, Inc.
Rees Engineering and Environmental Services
Spatial Engineering, Inc.
Tidewater Atlantic Research, Inc

Savannah Harbor Expansion Project

The U.S. Army Corps of Engineers is the Lead Federal Agency in the preparation of the Environmental Impact Statement for the Savannah Harbor Expansion Project. Four other agencies have agreed to serve as Cooperating Agencies in the preparation of the document. They are the Environmental Protection Agency, the Department of the Interior (US Fish and Wildlife Service), the Department of Commerce (National Marine Fisheries Service), and the Georgia Ports Authority. The Georgia Ports Authority will continue to fund most of the underpinning technical work for these efforts.

The U.S. Army Corps of Engineers, Savannah District, maintains a website that contains specific information on the Savannah Harbor Expansion Project. The address is http://www.sas.usace.army.mil/shexpan/Home.htm

The Georgia Ports Authority maintains a website for the Savannah Harbor Expansion Project where transcripts of the Stakeholders Evaluation Group meetings are available including other information. The address is http://www.sysconn.com/harbor.